

In re Patent Application of:
YAO
Serial No. 10/736,859
Filed: 12/16/2003

AMENDMENTS TO THE CLAIMS

1. to 5. (Cancelled)

6. (currently amended) ~~A photodiode as defined in claim 1~~ A photodiode comprising:

a) a semiconductor intrinsic light absorption layer having a thickness t_i ;

b) at least one of a p-doped light absorption layer and an n-doped light absorption layer;

wherein the p-doped light absorption layer has thickness t_p and the n-doped light absorption layer has a thickness t_n , and wherein $(t_p + t_n)/t_i$ is greater or equal to 0.17, wherein $t_i > 0$; and wherein at least one of the p-doped light absorption layer and the n-doped light absorption layer have a doping concentration of d_0 wherein the dopant concentration d_0 layers is in-between $1e17$ and $2e18$ cm^{-3} , while the intrinsic layer has doping below $5e14$ cm^{-3} ; and

c) a cathode electrode and an anode electrode electrically couple with the n-doped light absorption layer or the p-doped light absorption layer, respectively.

7. (currently amended) A photodiode as defined in claim [[2]] 6, wherein the semiconductor intrinsic layer and the at least the p-doped light absorption layer or the n-doped light absorption layer are sandwiched between the cathode and anode electrodes.

8. (currently amended) A photodiode as defined in claim [[2]] 6, wherein the light absorption layers consist a p-doped light

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absorption layer, and the intrinsic light absorption layer, said layers being adjacent to one another.

9. (currently amended) A photodiode as defined in claim [[2]] 6, wherein the light absorption layers consist an n-doped light absorption layer, and the intrinsic light absorption layer, said layers being adjacent to one another.

10. (cancelled)

11. (original) A photodiode as defined in claim 6, wherein the total thickness of the doped and intrinsic light absorption layers is greater than $v/(2f_{3-dB})$ by 20% or more, where v is the saturation drift velocity of either the electron or the hole, whichever is smaller, in the intrinsic light-absorbing layer, wherein f_{3-dB} is the frequency at which the amplitude of responsivity of the photodetector is reduced to $1/\sqrt{2}$ of its DC low-frequency value.

12. (original) A photodiode as defined in claim 8, wherein the total thickness of the doped and intrinsic light absorption layers is greater than $v/(2f_{3-dB})$ by 20% or more, where v is the saturation drift velocity of either the electron or the hole, whichever is smaller, in the intrinsic light-absorbing layer, wherein f_{3-dB} is the frequency at which the amplitude of responsivity of the photodetector is reduced to $1/\sqrt{2}$ of its DC low-frequency value.

13. (currently amended) A photodiode as defined in claim [[1]] 6, wherein the presence of the p-doped or n-doped absorption layer increases by 20% or more the responsivity x bandwidth

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product over a p-i-n consisting of an anode a cathode and an intrinsic layer sandwiched therebetween under the same temperature and bias conditions.

14. (withdrawn) A photodiode as defined in claim 1 including an avalanche multiplication layer, wherein the responsivity x avalanche-multiplication-gain x bandwidth product exceeds by 20% or more the responsivity x avalanche-multiplication-gain x bandwidth product of a same diode in the absence of said doped absorption layer under the same temperature and bias conditions.

15. (withdrawn) An photodiode as defined in 14 having a separate absorption and multiplication layer.

16. (currently amended) A photodiode as defined in claim [[1]] 6 with a 3-dB bandwidth frequency of 40GHz or higher, wherein the doped and intrinsic absorption layers are InGaAs lattice-matched to InP, and the total thickness of the doped and intrinsic light absorption layers is greater than 0.60 microns.

17. (currently amended) A photodiode as defined in claim [[1]] 6 with a 3-dB bandwidth frequency of 40GHz or higher, wherein the doped and intrinsic absorption layers are InGaAs lattice-matched to InP, and the total thickness of the doped and intrinsic light absorption layers is greater than 0.65 microns.

18. (currently amended) A photodiode as defined in claim [[1]] 6, having a 3-dB bandwidth frequency of 40GHz or higher, wherein the doped and intrinsic absorption layers are InGaAs

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lattice-matched to InP, and the total thickness of the doped and intrinsic light absorption layers is greater than 0.70 microns.